

General Principles of Pathophysiology

Energy Metabolism

Perfusion

Shock

Topics

- Define shock in terms of cellular function
- Review the requirements for adequate cellular perfusion (Fick principle)
- Review the mechanisms for Starling's law
 - Preload vs. afterload
 - Muscle contraction

Topics Continued

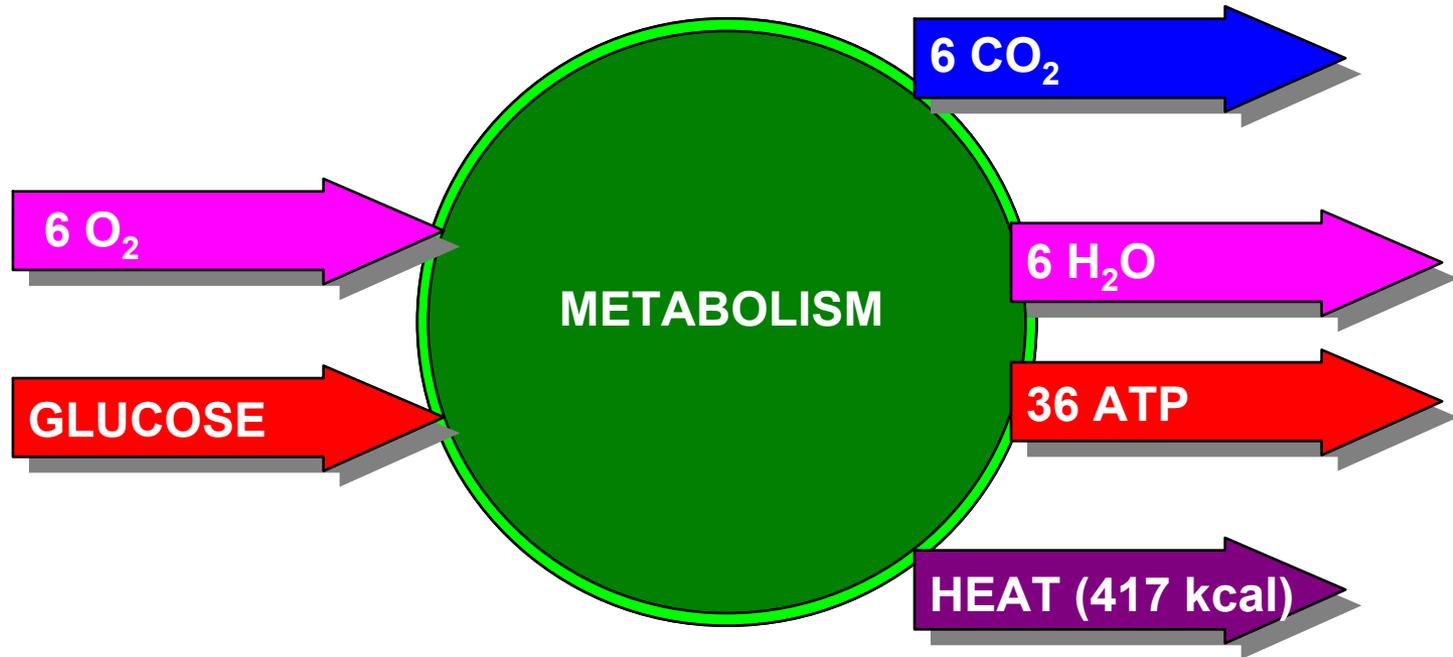
- Discuss the mechanisms for oxygen transport
 - oxyhemoglobin dissociation curve
- Define the stages of shock
- Describe different causes of shock
- Define multiple organ dysfunction syndrome

Shock Defined

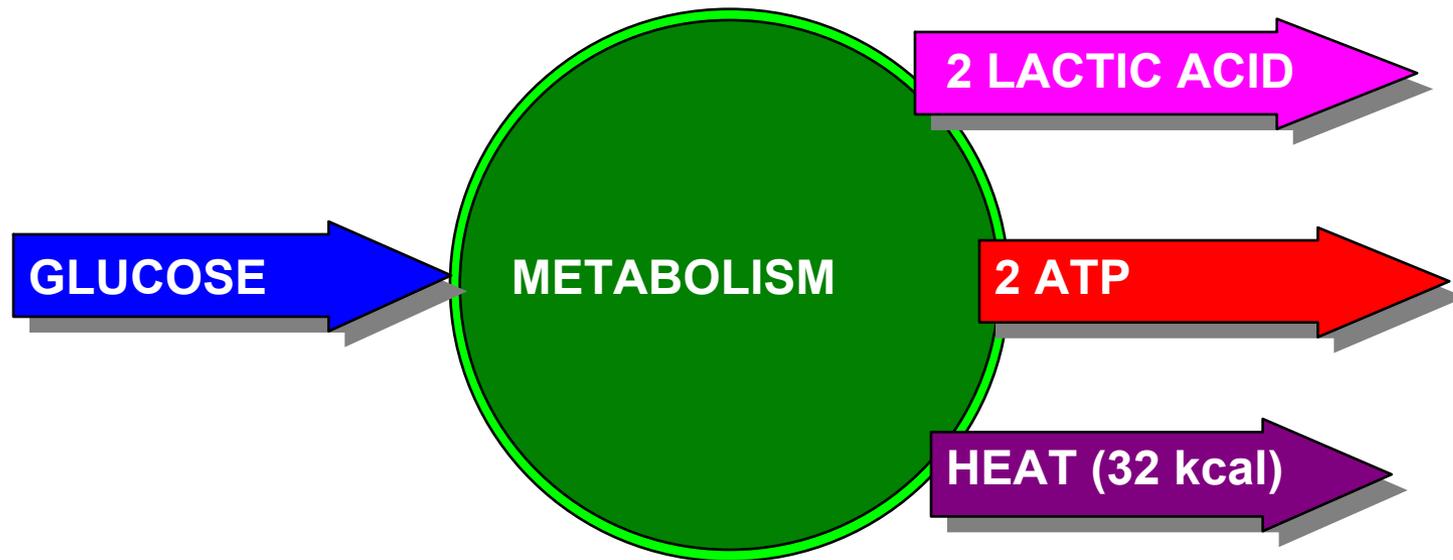
- Inadequate tissue perfusion
- Anaerobic metabolism

Final Common Pathway!

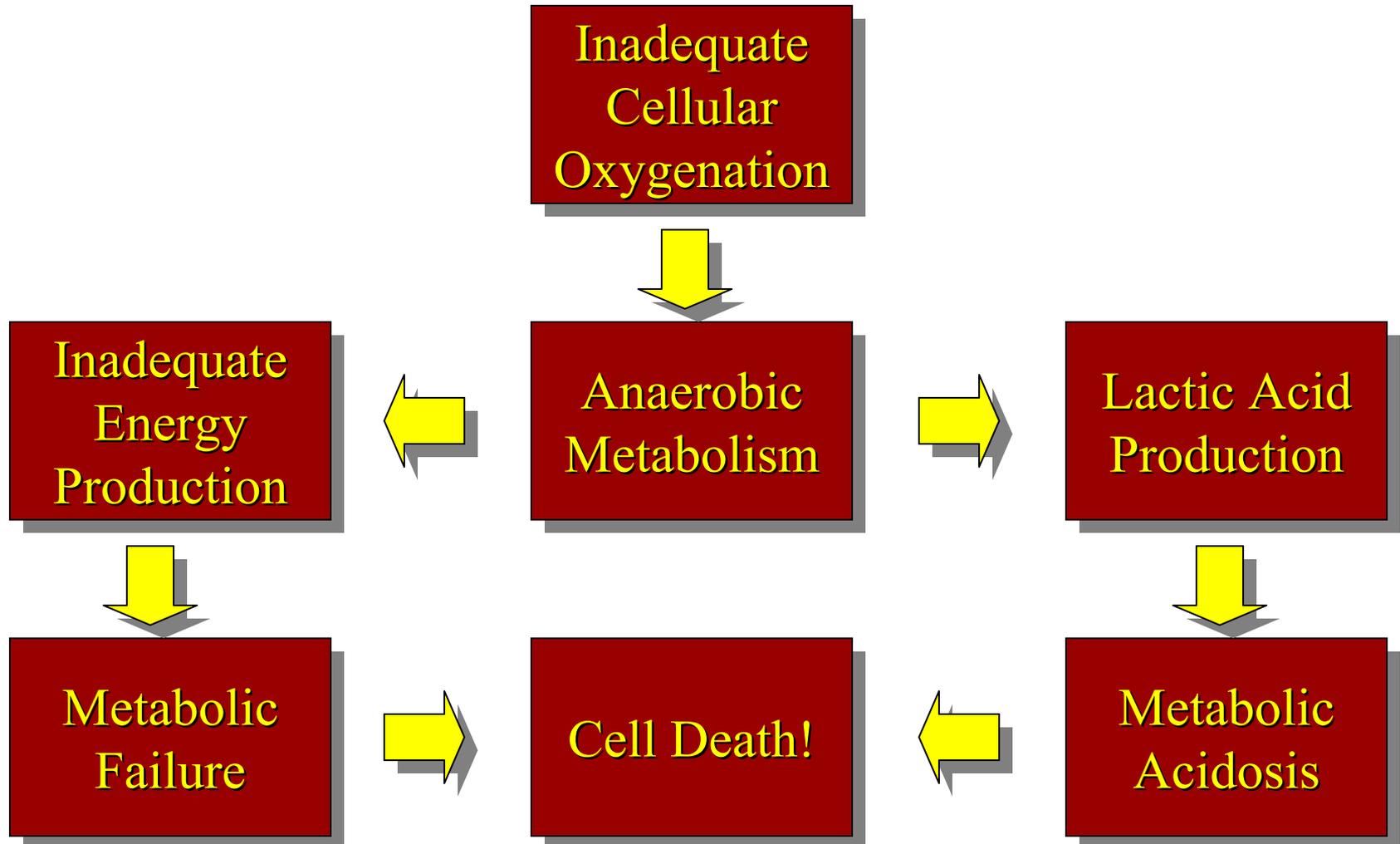
Aerobic Metabolism



Anaerobic Metabolism



Anaerobic? So What?



Homeostasis is maintenance of balance

- Requires proper functioning systems
 - Cardiovascular
 - Respiratory
 - Renal

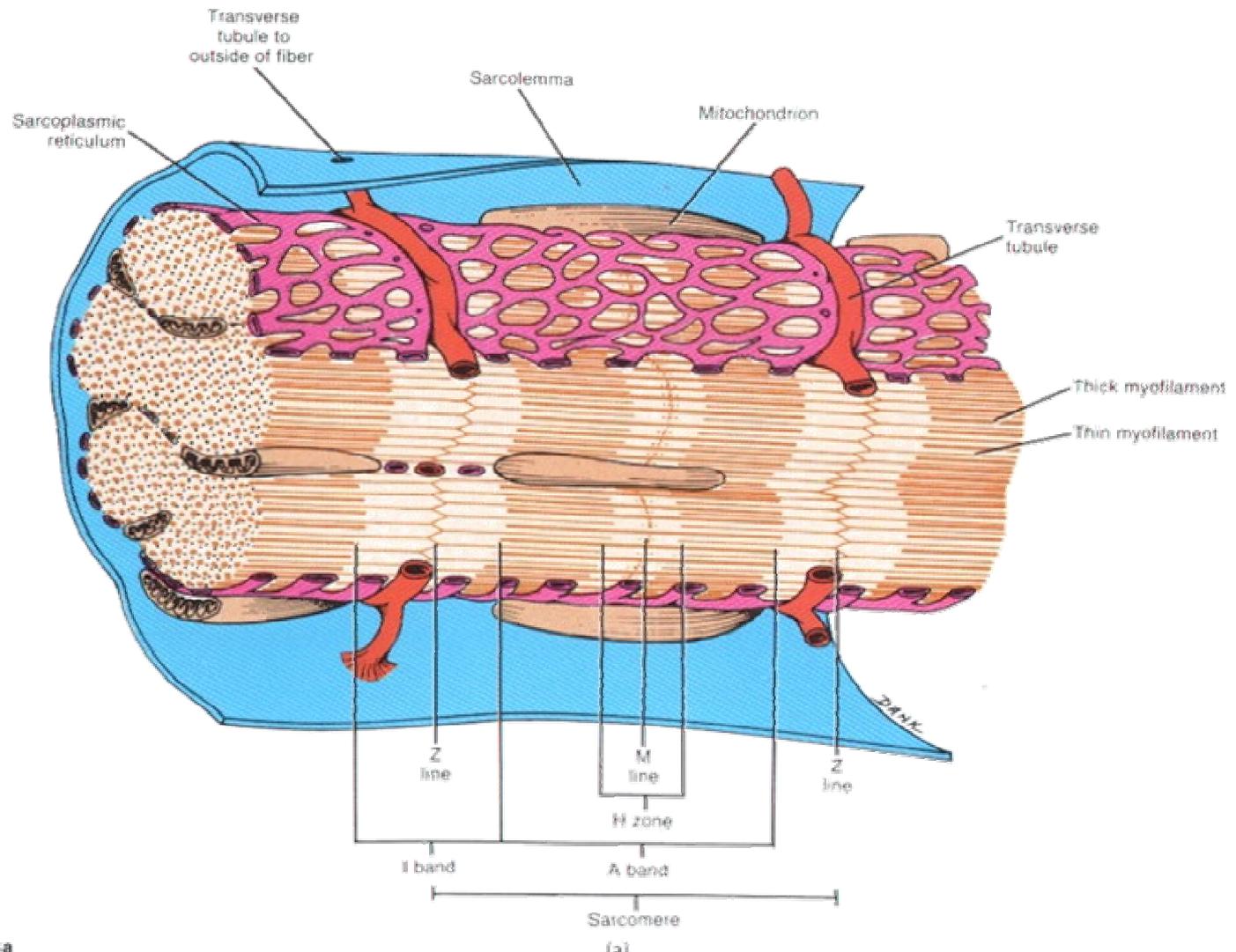
Physiology of Perfusion

- Dependant on 3 components of circulatory system
 - Pump
 - Fluid
 - Container

Factors Affecting The Pump

- Preload
- Contractile force
 - Frank-Starling mechanism
- Afterload

Muscle Anatomy



What Is Blood Pressure?

$BP = \text{Cardiac Output}$
 $\times \text{Systemic Vascular Resistance}$

$CO = \text{Stroke Volume}$
 $\times \text{Heart Rate}$

What Affects Blood Pressure?

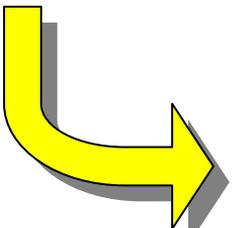
- ANS balance
- Contractility
 - Preload
 - Starling's law
- Afterload

Autonomic Nervous System Review...

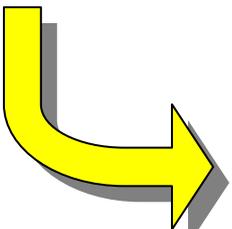
Quiz Time! Yeah!

Changes in Afterload and Preload

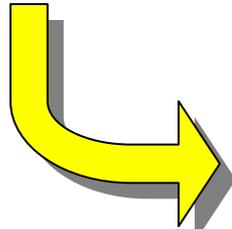
- ↑↑ Peripheral vasoconstriction...



■ ↑↑ peripheral vascular resistance...



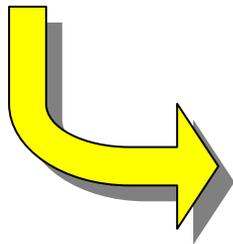
■ ↑↑ afterload...



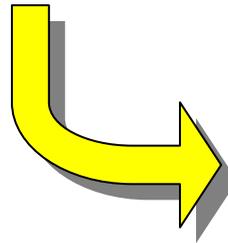
■ ↑↑ blood pressure.

Changes in Afterload and Preload

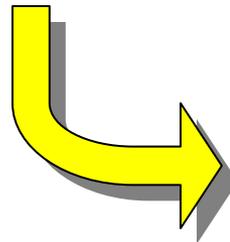
- ↑↑ Peripheral vasodilation...



■ ↓↓ peripheral vascular resistance...



■ ↓↓ afterload...



■ ↓↓ blood pressure.

Changes in Afterload and Preload

- ↑↑ fluid volume...

■ ↑↑ preload...

■ ↑↑ contractility
(Starling's Law)...

■ ↑↑ blood pressure.

■ ↑↑ cardiac output.

Changes in Afterload and Preload

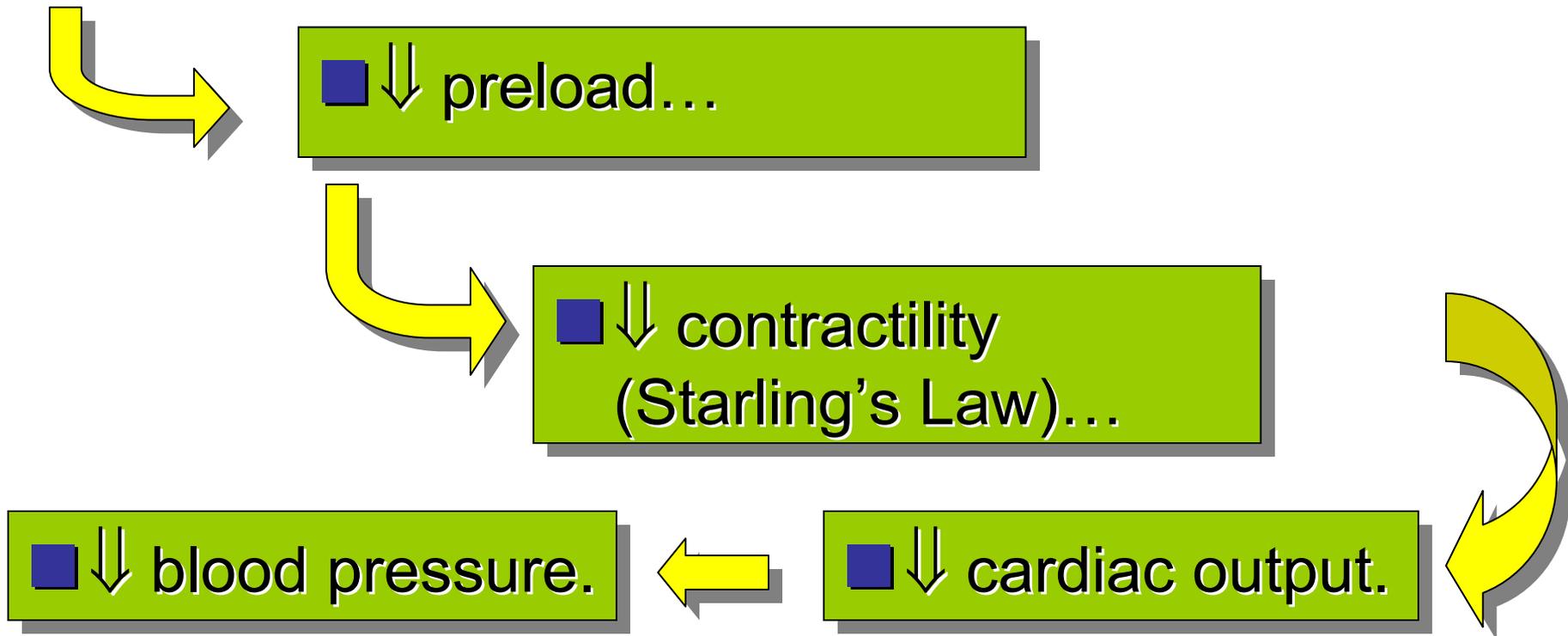
- ↓↓ fluid volume...

■ ↓↓ preload...

■ ↓↓ contractility
(Starling's Law)...

■ ↓↓ blood pressure.

■ ↓↓ cardiac output.



Fluid

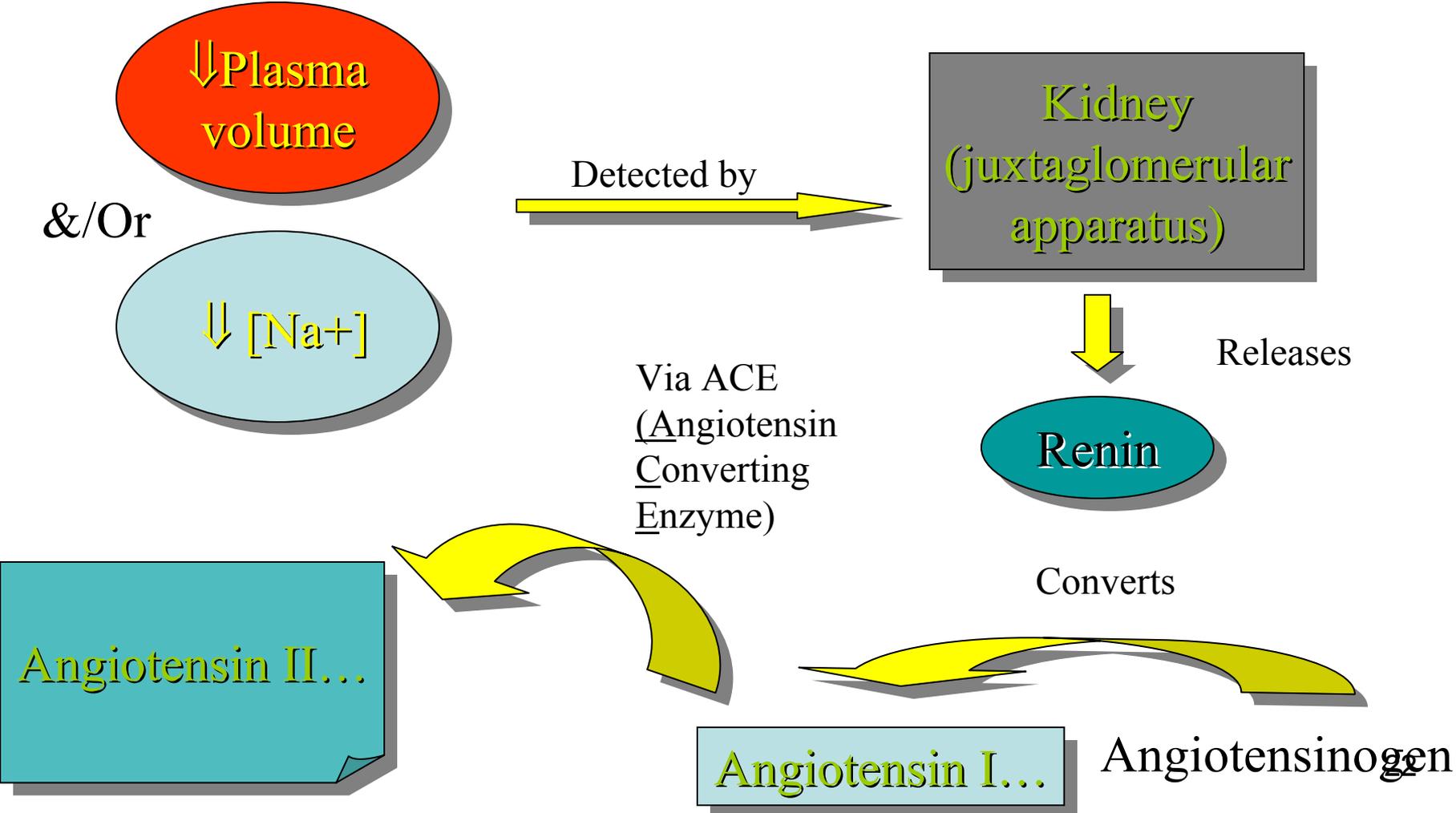
- Must have adequate amounts of hemoglobin
- Must have adequate intravascular volume



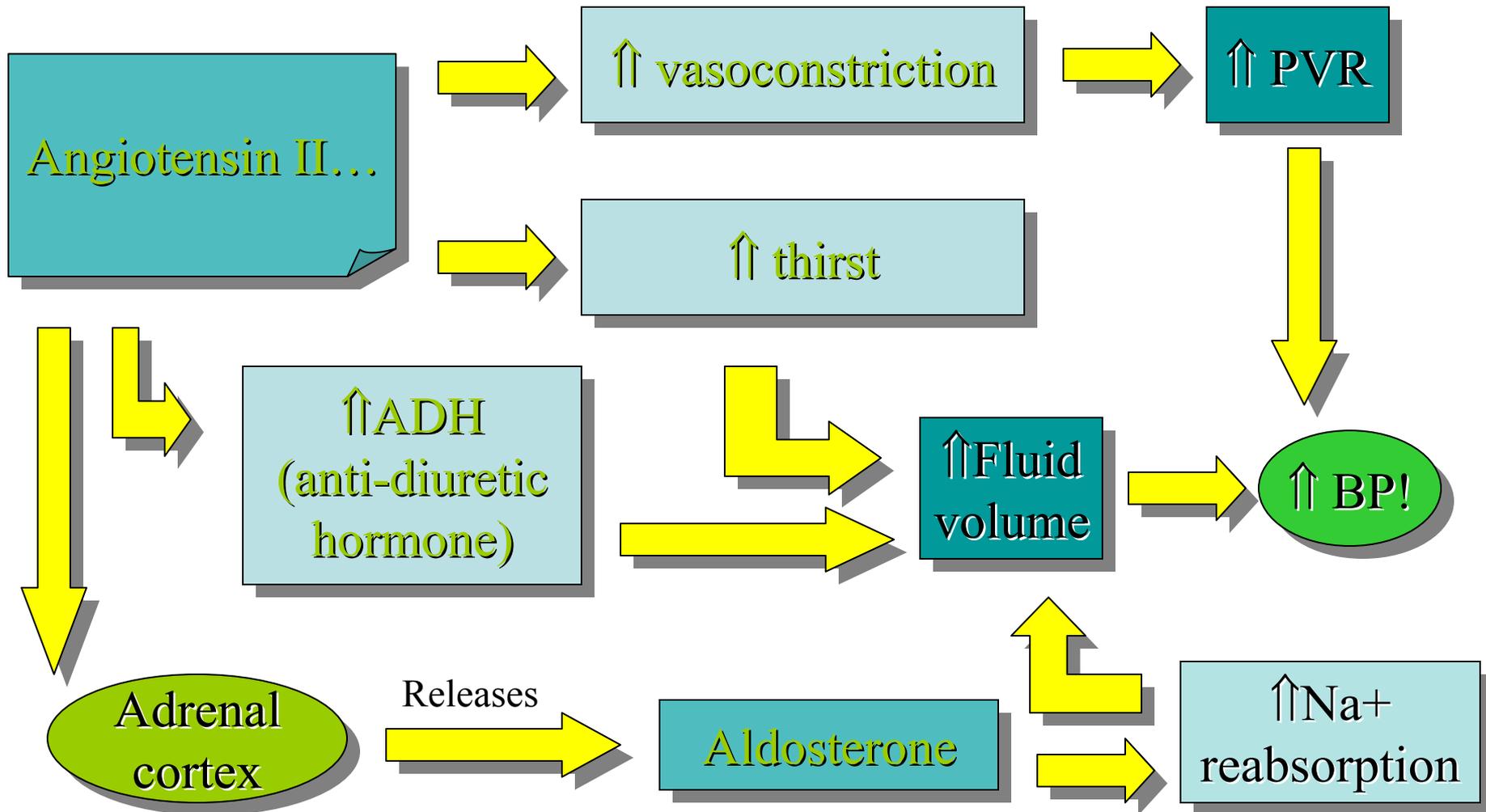
Maintenance of Fluid Volume

- Renin-Angiotensin-Aldosterone system.
 - Works through kidneys to regulate balance of Na^+ and water.

Renin-Angiotensin-Aldosterone



Renin-Angiotensin-Aldosterone



Hemostasis

- The stoppage of bleeding.
- Three methods
 - Vascular constriction
 - Platelet plug formation
 - Coagulation